Trichosteresis is easily distinguished from other megaspilids by its forewing characteristics (lacking a marginal fringe and the disc mostly bare or with microscopic hairs). The three species from North America also have the radial vein shorter than the breadth of the pterostigma. The mesonotum of *T. vitripennis* has a complete and deeply impressed longitudinal median line, and two anterior longitudinal furrows between the median line and notauli; in *T. floridanus* the median line is incomplete posteriorly and the two longitudinal furrows absent. The species from Nevada closely resembles *T. vitripennis,* but its first funicular segment is about the same length as the pedicel; in *T. vitripennis,* this segment is 1.5–2 times longer than the pedicel.

All seven specimens are deposited in the collection at the Laboratory of Biological Control in Albany, part of the Essig Museum at the University of California at Berkeley.

Records.—Trichosteresis vitripennis: CALIFORNIA. *ALAMEDA Co.:* Oakland, 3 and 10 Jun 1993, R. Zuparko, *Quercus agrifolia* Nee, 2 females; Albany, 3 Oct 1992, R. Zuparko, *Medicago sativa* L., 1 female. *SAN BERNARDINO Co.:* San Bernardino, 12 Apr 1993, R. Zuparko, 1 female.

Trichosteresis sp.: NEVADA. *WASHOE Co.*: Needle Rocks at N end of Pyramid Lake, 15 Sep 1983.

Robert L. Zuparko, *Laboratory of Biological Control, University of California, Berkeley, 1050 San Pablo Avenue, Albany, California 94706.*

PAN-PACIFIC ENTOMOLOGIST
71(1): 66–68, (1995)

Scientific Note

INITIATION OF MATING ACTIVITY AT THE TREE CANOPY LEVEL AMONG OVERWINTERING MONARCH BUTTERFLIES IN CALIFORNIA

Overwintering monarch butterflies, *Danaus plexippus* (L.) (Danaidae, Lepidoptera) congregate west of the Rocky Mountains in clusters, ranging from a few hundred to several thousand individuals, in certain groves along the California coastline. This aggregation behavior, the result of migration to escape the rigors of winter, is believed to lessen bird predation (Fadem, C. M. & A. Shapiro. 1979. Pan-Pacif Entomol., 55: 309–310) and concentrates the sexes in a locale that increases their chances of mating in the spring. Mating activity at a wintering grove may occur sporadically throughout the winter, but begins in earnest by early or mid-February and lasts approximately two weeks. Females usually mate with several males before their spring dispersal to oviposition sites (Hill, H. F., A. M. Wenner & P. H. Wells. 1976. Amer. Mid. Nat., 95: 10–19). The males capture females in flight (Hill et al. 1976) or "nudge" them toward the ground (Pliske, T. E. 1975. Ann. Ent. Soc. Amer., 68: 143–151) before mating. Similar behavior has been observed in the laboratory (Rothschild, M. 1978. Antenna, 2: 38–39) and in summer populations (Zalucki, M. P. 1982. J. Aust. Ent. Soc., 21: 241–246).

Table 1. The average number of canopy and ground butterfly pairs recorded at two-h intervals (08:00 h to 14:00 h) on 6 separate days in February, 1993. The mean and SE are presented for each observational period.

	Time interval			
	08:00 h	10:00 h	12:00 h	14:00 h
Canopy attempts				
Male-male	4.3 ± 1.9	12.0 ± 2.2	6.2 ± 1.1	1.4 ± 0.6
Male-female	1.2 ± 0.6	5.3 ± 0.7	3.5 ± 0.6	0.8 ± 0.4
Ground pairs				
Male-male	1.2 ± 0.6	2.2 ± 0.7	1.2 ± 1.4	0.2 ± 0.4
Male-female	1.2 ± 0.7	5.5 ± 0.7	3.3 ± 0.8	1.6 ± 0.9

During February, 1993, at a winter site in Pismo Beach North State Park, San Luis Obispo County, California, (35°07′46″ latitude; 120°37′53″ longitude), I observed, using a spotting scope (20 × 45, Zoom Bushnell Spacemaster) and binoculars (10 × 50 Bushnell), mating activity occurring at the canopy level of large blue gum, (*Eucalyptus globulus* Labillardiere) and Monterey cypress, (*Cupressus macrocarpa* Gordon) trees. Males captured potential mates sunning on the foliage within butterfly clusters and/or on the foliage of neighboring trees. The male would fly above a butterfly (either a female or another male) that was resting on the foliage with outstretched wings and pounce and grasp the thorax of the individual with its legs. The pair frequently displayed rapid wing fluttering and other interactions typical of copulating pairs (Pliske 1975). If male-female paired, the struggling butterflies, after 3 to 10 sec, would slowly fall from the foliage to the ground and complete or abandon their mating activity. On two occasions, I observed a male capture and successfully couple with a female at the canopy level. Both matings occurred on the flat and shelf-like foliage of Monterey cypress. If two males, the interplay between them lasted < 5 sec, but was occasionally longer, especially toward the end of the overwintering season. In such cases, the pair fell from the canopy foliage and separated either before, or shortly after, landing on the ground.

I documented the initial and latter phase of mating activity by recording the number of canopy and ground butterfly pairs (male/female & male/male) at two-h intervals, starting at 08:00 h and ending when mating activity ceased (14:00 h). At the beginning of each interval, the number of ground pairs was counted beneath each cluster tree, before recording the number of canopy mating attempts observed during a thirty min period. At the end of thirty min, the number of paired butterflies on the ground was again recorded. This procedure was repeated on 6 separate days in February. The average number of canopy and ground pairing attempts for each two-h interval showed a similar pattern of mating activity at the foliage level and on the ground (Table 1). Pairing attempts began slowly in the morning, reached a peak at 10:00 h and slowly declined as daytime temperatures cooled. There were more male/male than male/female encounters at the canopy level, indicating that *D. plexippus* seek mates visually during the early stages of the mating sequences, resulting in many missed pairings. This relationship was exactly opposite on the ground, however, where more male/female than male/male couples were observed. Once physical contact of courtship is initiated,

the males are able to discriminate between the sexes (via visual or short distance chemical communication) resulting in longer interplay and frequently to a successful union.

I believe that the initiation of mating sequences on the canopy is common among overwintering monarch butterflies and that it has been overlooked by earlier investigators. Once observed, it can be recognized easily; I examined and noticed this mating activity on a kodachrome slide I took in the winter of 1990–1991 and recently, in a picture of Mexican monarch butterflies on roosting trees published with a article in Natural History (Larsen, T. 1993. Nat. His., (6): 30–39). The capture of mates in flight, at least for California overwintering monarch butterfly populations, may not be as frequent as those initiated at the canopy level. I observed only one in-flight capture of a female by a male during many hours of field observations. This single event was observed when the female slowed her flight while trying to land on foliage, and was then captured by a male. The capture of stationary "mates" concentrated in a small area (foliage of roosting trees), after months of overwintering, saves time and energy, and provides maximum opportunities for mating.

Acknowledgment.—I thank Dennis Frey, Harry Kaya and Aryan Roest for their critical review and comments and Christopher Nagano for asking the question "where" mating was occurring.

Kingston L. H. Leong, *Department of Biological Sciences, California Polytechnic State University, San Luis Obispo, California 93407.*

PAN-PACIFIC ENTOMOLOGIST
71(1): 68–71, (1995)

Scientific Note

OBSERVATIONS OF THE FORAGING PATTERNS OF *ANDRENA* (*DIANDRENA*) *BLENNOSPERMATIS* THORP (HYMENOPTERA: ANDRENIDAE)

Pollinator foraging movements can determine pollen transfer among flowers and thus may affect pollen and gene flow within and among plant populations (Handel, S. N. 1983. pp. 163–211. *In* Real, L. (ed.). Pollination biology. Academic Press Inc.). From a landscape perspective, pollinator foraging patterns form a spatial link among available floral resources that is bounded by the particular species' flight and floral preferences. Foraging studies that emphasize the latter can also help identify the spatial requirements of insect pollinators. Therefore, quantification of pollinator foraging patterns can yield information pertinent to floral ecology and evolution as well as to landscape utilization by insect pollinators. Unfortunately, many insect pollinator foraging patterns are not well documented, and that is especially true for solitary bee species.